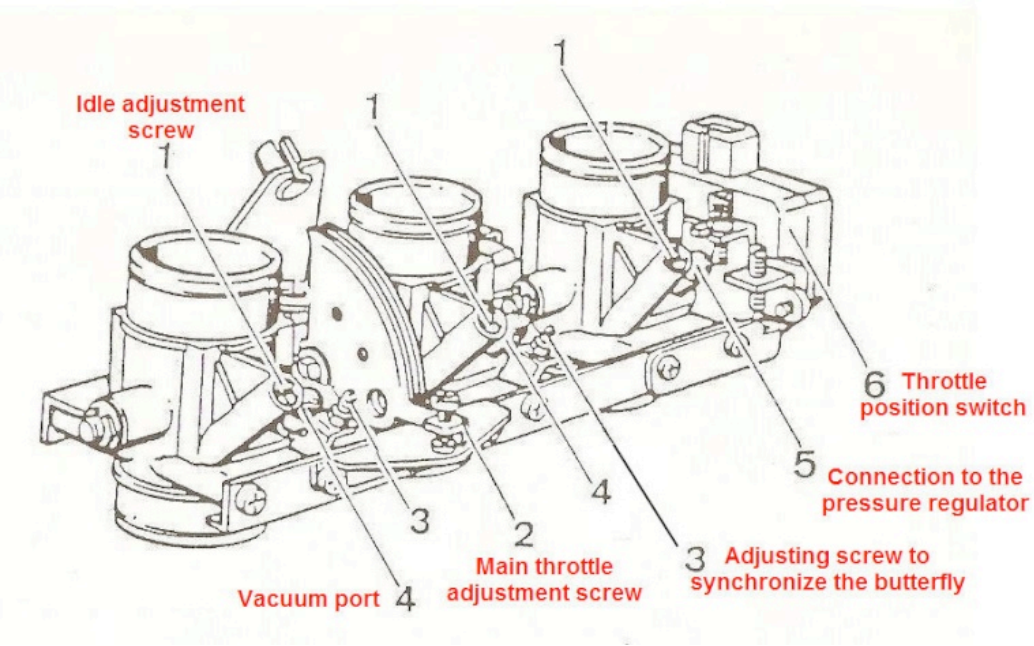
K throttle Body Synching

http://www.k100-forum.com/t1526-how-to-balance-the-throttle-bodies-solved

Here is the procedure for a K75. The same applies to the K100 (1 extra cylinder). As pointed by Don Eilenberger, the bike needs to be checked for intake leaks first. You should also adjust the valves and clean the air filter before modifying the setup of the throttle body.

- Start your engine and warm it up to its normal operating temperature.
- Remove the 2 caps on vacuum ports (#4) and connect the 2 vacuum gauges (or mercury columns).
- Remove the hose going from the Throttle body to the pressure regulator (#5). Install a tee and connect the 3rd vacuum gauge (or mercury columns) on the tee. (We want to keep the pressure regulator in line as we want to do a dynamic balancing in the same condition as if the bike was normally operating)
- Unset or remove the Throttle Position Switch located at the end of the throttle body.
- Slack off the main throttle adjusting screw (#2). Screw it back until it comes in contact again. Then screw it 1 full turn again.
- Start the engine and set it to run between 1,250 and 1,500rpm. You can slide a small spacer under screw #2 to maintain a constant rpm. (A higher rpm will decrease the depression and makes it harder to adjust).
- The 3 mercury columns should be at equal level. If not, adjust screw #3 on cylinder 1 and 3 to get a good balance. Cylinder #2 is the reference.
- When you are happy with the balancing, stop your engine.
- Remove the spacer inserted under screw #2.
- Re-install the TPS and set it up (you should hear the 'click' of the switch when screw #2 comes in contact).
- Screw in the idle screws until they bottom up (lightly). Unscrew them a full turn.
- Start your engine and balance the idle on each cylinder by turning screws #1 . You should not have to turn them more than 1/2 turn CW or CCW.

Note: if you are using a Carbtune II, it comes with piece of hose having a smaller diameter. This is a restrictor to help stabilize the reading. You should cut it in 4 equal parts and insert them at approximately 4" (or 10 cm) from the throttle body. (You have to cut the 4 long hoses)



By: Rob Lentini
June 1995

Here's a real simple way to ascertain whether your K's throttle plates are in synch--the adjustment we are admonished to never touch!

Attach a carb stix, other mercury synchronizer, or very accurate bourdon tube vacuum gages to each vacuum access port (covered by rubber caps and the fuel pressure regulator line). Connect the loose fuel pressure regulator vacuum line to the corresponding carb stix column (or gauge) using a "T" fitting.

Warm the engine. Screw in and lightly seat all three (or four) idle bypass synch adjustment screws (count the turns in for each, and record). Doing this will slow or stall the engine, so actuate the starting lever (choke) to maintain normal idle speed****[see amended procedure below-wd]**.**

When the screws are fully seated, any measured vacuum imbalance is then a function of variance in throttle plate opening ONL Y, and is adjustable from between the throttle bodies. If out of synch, carefully adjust to equalize all readings. At this point, increase RPM slowly and smoothly, checking for different readings at various engine speeds. You should see little or no change, since adjustment at the smallest throttle opening is most critical. Once throttle plate synch is set, reopen the idle bypass synch adjustment screws (per your notes), and fine-adjust them to re-establish correct idle speed and synchronization with the "choke" lever off.

Following this procedure should not affect the adjustment of the throttle switch/position transmitter. Check if in doubt. On older Ks you're listening for an audible "click" just as the throttle returns to the closed position. Follow this procedure and your perfect throttle body synchronization will eliminate much vibration.

AMENDED PROCEDURE

I stand corrected! A few days ago I shared with all a procedure to synch the throttle bodies of K motors. In it, I suggested using the choke lever to maintain idle speed while the bypass screws were closed and the butterflies checked for equal vacuum (and adjusted if required).

Joe Senner and Tom Coradeschi pointed out a problem, one I hadn't thought about. Their contention was that the choke opens the butterflies from the aft end, while the throttle cable itself actuates from the center. Both guys said vacuum differences would be measured between these two methods, and opening the throttle through the twist grip was the correct way.

Anal as I am, I assured Tom I would verify his empirical data right away, so I jumped on the K last night to vindicate myself (everybody has an ego!).

Using my Carb Stix, I measured a 2-3 cm delta in the mercury column between injector body number 3 (the aft one) and the other two when switching from throttle to choke actuation. Whether this is enough to cause vibration or rough running is debatable. Yet, the whole point of doing the synch procedure is to "knats ass" the adjustment.

Hi Folks,

As a newbie to all this I've a couple of questions that follow on from Duck's generous posting.

1) Where is the inter-TB adjusting screw for cylinder 4? Found bypass screw and bypass bleed but no inter-TB screw. Is it under the TBS?

2) Am looking for the hints for adjusting the TBS referred to by Duck but can't find it. Any clues?

I've followed the instructions detailed above and seen significant improvement in noise and rock knocking using a single

home-made manometer and a lot of patience. I just need to work out how to reset cylinder 4 for a full house.

Thanks in anticipation.

I don't do anything with cylinder 4 and use this as my base to set the others by. I have found when setting the TBs that when you adjust one it changes the others. That is why I feel it is important to have a 4 gauge meter so you can see how the adjustments change the other TBs. I use a Carbtune and it works great with no nasty mercury.

_____
Rich

There are 3 inter TB adjusters only!
1 between cyls 1 and 2
1 between cyls 2 and 3
1 between cyls 3 and 4.

start with 1and2,
than do 3and4
than do 2and3

indeed use a 4 column one, it helps!

Throttle Body Repair if Linkage Screws are Maladjusted

Original post http://www.bmwmoa.org/forum/showthread.php?t=25410
My K100RS was returned to me from service with the complaint of a poor fast idle. It now idles at 1500 and cannot be adjusted downward by the common adjusting screw which moves the throttle bodies. I am pretty frustrated, but at least the fast idle works better. I am looking for information on how the fuel injection can be adjusted.

I have an electronic 2 cylinder balancing meter for my R1100RT. I have an IR thermometer. I have tools. I do not want to take the bike back to the shop. When I asked about the setup, the owner said he did it on a cold day and said don't worry about it.

Here is what I see. There are 4 throttle bodies daisy chained together. Each has a brass adjusting screw and 3 have an adjustment screw locked with an 8 mm nut which seem to have some course regulation on the bodies. If I see this correctly, bodies 2-4 have course adjustments, but not #1. I see and hear the black module off the end of #4 and hear the micro switch open and close as the throttle opens and closes.

Here are my questions. Can anyone answer them???

1.) What, exactly, do the brass screws do? Air, fuel, etc.? If the screw is turned in does the mixture to that cylinder enrichen or lean?

2.) How do I continue to work with the adjustment of the 3 linkage screws as it seems moving the four brass screws do not affect the idle significantly, that is I still cannot lower the idle? I presume movement of those three screws WILL change the idle?

3.) Since I do NOT have a 4 channel carb stix, what cylinder should I set as a reference in order to synchronize the throttle bodies? I would think the one without the throttle body adjustment would be the most likely. Will this become #1?

Preliminarily, I have already made some adjustments using the brass screws and the 3 screws on the linkage. The idle is much lower and adjustable, but I feel that more can be done to make sure the throttle bodies are in synchronization. If I had more technical information, then I could make a more educated guess as to how the adjustments could affect the performance.

Finally, can I use my IR thermometer to assist in adjusting the system? In my aircraft engine work, the mixture is adjusted with peak EGT in mind. Running either rich or lean will decrease EGT.

Thanks, I hope some technical people are out there. I am the original owner of this 1985 and we have about 33K happy miles so far. I would like to keep up the performance and adjustments myself if possible.

1.) *What, exactly, do the brass screws do? Air, fuel, etc.? If the screw is turned in does the mixture to that cylinder enrichen or lean?*

These are air bypass screws - open = more air goes around the throttle butterfly. They are almost always (1) dirty (2) screwed out by mechanics

2.) *How do I continue to work with the adjustment of the 3 linkage screws as it seems moving the four brass screws do not affect the idle significantly, that is I still cannot lower the idle? I presume movement of those three screws WILL change the idle?*

You don't. DO NOT TOUCH THESE SCREWS. The throttle bodies are balanced on an air-bench at the factory, and you can't reproduce that accuracy on the bike. These screws should have blue/green paint on them - indicating leave them alone

3.) *Since I do NOT have a 4 channel carb stix, what cylinder should I set as a reference in order to synchronize the throttle bodies? I would think the one without the throttle body adjustment would be the most likely. Will this become #1?*

You don't. You shouldn't touch the inter-throttle-body screws.

Well - let's try getting it back to some semblance of running correctly.

- - First - do you have a manual, if so which one? If not BUY one right now. Clymer or Haynes.
- - The bike needs to be checked for intake leaks. At 23 years old - you more than likely have some. Move the bike outside your garage. Have a fire extinguisher handy. Start the bike, let it idle. Take some FLAMMABLE carb cleaner spray and spray very small spritz's around the injectors and the throttle bodies. ANY CHANGE in idle indicates a leak. FIX THE LEAKS before going any further. Try not to start a fire - there is hot exhaust right on the bottom of the head. If you don't know if your skill level is good enough for doing this STOP and find someone who has the necessary skill level. I don't want you burning your house down.
- - The bike has to have the valves precisely adjusted. You're going to be using the engine as an air-pump for a flow bench. Without the valve adjustment it just isn't going to work. They have to be adjusted right, and the closer you can get them to each other the better this is going to work.
- - OK - once the above is done - remove all the brass screws. Clean them and use a Q-tip in carb cleaner to clean the bores they go into. Replace the O rings on them. Screw them in until they *gently* bottom out - then open each of them exactly one turn. IF there are any steps on them from over tightening them - replace them. You can't adjust damaged ones.
- - Remove the throttle-position-switch from the rearmost TB. We'll get to replacing and adjusting it when we're all done here.
- - Connect the 4-channel vacuum gauges. Start the bike. See how it looks at idle. Since you've already misadjusted the inter-TB screws, we'll start there. Adjust these screws until all channels read the same. We're not worrying a lot about idle speed, but don't turn them all in the same direction. Balance the vacuum on them.
- - Open throttle to 2,000 RPM. Do all of the channels change at the same rate? If not - you're going to have to adjust the inter-TB screws at 2,000 RPM until they do. Once you get that right, we're going back to an idle balance adjustment
- - Once all channels look the same at 2,000 RPM, drop back to idle (~1,000 RPM). If the channels aren't balanced - use the brass screws to balance them out. You should not have any brass screw more than 1/2 turn different from the rest. If you do - then the inter-TB screws still aren't correct, and you have to repeat the steps above. (ALL brass screws should be between 1/2 turn and 1.5 turns out. None should be out more than 1.5 turns, and none in more than 1/2 turn.

Once all this is done - the vacuum gauges should move in sync with each other from 1,000 RPM - to about 5,000 RPM. If they don't - repeat the steps above.

Doing this without eliminating any leaks and adjusting the valves is futile, and I'd suggest taking the bike to a dealer if you can't do these first. You can only do this - and even then it's going to be difficult - with the cylinders drawing the same vacuum.

Hopefully at this point - you have balanced TB's. You should use the central idle adjustment screw to set the basic speed. If you didn't unscrew all the brass screws more than 1.5 turns out - it should fall within the range of this screw.

Finally - reinstall the TPS that we removed above. Turn it counter clockwise until you JUST hear it click with the throttles

closed. Turn the grip to fully open the throttle-bodies and you should hear it click again. What you don't want to happen is have the throttle-bodies held open by this switch.

HTH, and let us know how it goes.

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Don Eilenberger, MOA Ambassador - http://www.eilenberger.net
Spring Lk Heights NJ - NJ Shore BMW Riders
Ex-lotsa beemers, '07 R1200R (current ride) and some bimmers.

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http://www.bmwsearch.net/main/digest/V2002/N09/digest-20020900.html#subject2002090013
Date: Sun, 02 Jun 2002 20:46:03 -0500
From: Paul or Voni Glaves <p_vglaves>
Subject: BMW: K75 Throttle Bodies

On the K bikes the 3 (or 4) throttle bodies are mounted in line and are liked together by a mechanical linkage. They are synchronized on a flow bench and then the michanical linkage screwes are "locked" with the imfamous and notorious blue paint. Fine differences in balance which can occur with wear are supposed to be compensated for by adjusting air bleed screws.

The factory position (that they whole mess needs to be replaced if the screws are messed with) is a bit cataclysmic. I would never recommend messing with those linkage screws - but if it happened to your bike you can restore order. It is just a very precise, futzy procedure. Lightly seat the brass air bleed screws - then turn them out 1/4 turn. Use the #2 cylinder (with the throttle cable to it) as your reference throttle body. Using a Carb Stix or Twin Max carefully synch #1 to #2. Then carefully synch #3 to #2. If you have a K100/K1100 carefully synch #4 to #2. Check each synch both at idle and at higher rpms. You need the throttle plates to move together. It will be the most precise at idle however, because the % difference of air (and vacumn) will be greatest at the least throttle angle. Recheck by comparing other cylinders at idle, #1 with 4, 3 with 4, etc - but always use #2 as your base for adjusting.

Future fine adjustments should be made only with the air bleed screws.

Paul Glaves

http://www.bmwmoa.org/forum/showpost.php?p=312424&postcount=12
Great link. What Paul doesn't cover is:

- Make SURE the TPS isn't keeping things open or interfering with other adjustments. The bike will run just fine with it disconnected or even removed. Only thing is - the injection won't be shut off on de-cel and the extra rich mixture won't be available on full throttle - but for purposes of tuning, you're almost better simply removing it.

- Make SURE there are no vacuum leaks. This means the crankcase vent hose (Z hose behind TB3), all the O rings (brass screws and injectors) and the throttle-body mounts to the head. Quick test for this is with carb-

cleaner (flammable kind) very carefully spritz'd (TINY spritz) around the TB assembly and injectors while the bike is idling. ANY change in idle indicates a leak. Leaks have to be fixed before even thinking about making these adjustments.. And I trust you to be careful and not torch the bike or yourself doing this (outside, fire-extinguisher, etc.)

- Make SURE the valves are adjusted as perfectly as possible..

Since you're basically using the engine as a flow bench - all the above have to be true to get the TB back into reasonable balance.

http://www.bmwmoa.org/forum/showpost.php?p=794733&postcount=7
The "idle screw" should never be used to adjust idle speed. Ever! Here is why. Moving that screw moves the whole throttle shaft. What is down on the end of that shaf, at the rear of the throttle rack? The Throttle Position Switch, or TPS for short. The position of the TPS on the throttle shaft is critical and once set, you do not want to, and should not have to, disturb it. The correct method to adjust idle speed is by using the brass bypass screws on each Throttle Body, or TB for short.
Using mercury manometers or "carb sticks" as most call them with the hoses attached to the spigots on each TB, you can set idle speed and adjust TB balance at the same time.
If you do disturb the positon of the throttle shaft by turning that screw, you have to check and if necessary adjust the TPS. The way to check it is to listen very carefully, as you crack the throttle open you should hear a faint click inside the TPS. If you don't, you need to release the two phillips head (or filister head for our European brothers and yes they are a royal beyatch to get at, oh well) screws holding the TPS in position and move it gently until you position it such that just opening the throttle causes a click to be heard.
Have you ever wondered why some K bikes make hellacious backfires? This is from adjusting idle speed using the screw in the middle of the throttle rack. Don't fool with it, use the bypass screws to set idle speed and TB balance.

By the way, it is indeed possible to set throttle plate position on the throttle rack using the small screws with the locknuts and the paint. With enough miles, we are talking six figure miles, accumulated wear in the throttle rack will allow throttle plate position to wander, affecting TB balance and drivability. You will notice that over time you have to unscrew some brass bypass screws more than others to get the mercury colums of your carb sticks to equalize. This is your clue the actual throttle plates and shaft have enough wear to allow throttle plate position to wander. If you want I can post a procedure to adjust the throttle plates themselves. It is simple and straightforward to do, especially if you have balanced carbs on some Japanese multis. Your engine makes a darn fine "flow bench" if you know how to use it!

Setting L-Jetronic Fuel Injection CO Mixture

http://skylands.ibmwr.org/tom/tech/co-setting.html

By Rob Lentini <roblentini@cox.net>
'87 K75S
Tucson, AZ
K Whiner MC#11

Here's a manual method of setting L-Jetronic K bike fuel injection CO (carbon monoxide) mixture without the need for an exhuast gas analyzer:

1. Thoroughly warm the engine.
2. Remove the rubber plug from the top right corner of the air box, above the engine. Using a 5mm allen, adjust the air flow meter idle air bypass screw under the plug for highest attainable idle speed. This should be about 1-2 turns out from the fully-seated position CW.
3. Using a Carb Stix mercury manometer or vacuum gages, reset the butterfly bypass screws to resynchronize and establish an idle of 1050 rpm, or about one tach needle width above 1000 rpm.
4. Now turn the idle air bypass screw CCW (from the top) until rpm is lowered by 50 rpm to 1000, about 4-5 total turns out. *(This is called the lean drop method of setting CO, if you don't have an exhaust analyzer.)*

If you live above 4000 ft elevation, be sure to install the high altitude compensating plug into the harness. There's a receptacle taped to the frame on the left under the side panel.

As a final check, you know you have done it all correctly when:

1. You press the starter button with the engine running and the rpm stays the same or slightly increases (enriching signal to the computer).
2. You pull out the high altitude plug and the rpm also increases (again, enrichening signal to the computer, but less so than the starter. You've set it lean, so enrichening will increase rpm).

Don't forget to reinstall the rubber plug. I've also assumed you've got a 2 valve K with L-Jetronic injection. Motronic works differently. Have fun!